

[C23.1 Basic landing conditions]

Condition	Tail wheel type		Nose wheel type		
	Level landing	Tail-down landing	Level landing with inclined reactions	Level landing with nose wheel just clear of ground	Tail-down landing
Tail (nose) wheel loads (V_f)	0	$(n-L)W a/d$	$(n-L)W b'/d'$	0	0
Tail (nose) wheel loads (D_f)	0	0	$KnW b'/d'$	0	0
Notes	(1), (3), and (4).	(4)	(1)	(1), (3), and (4) ..	(3) and (4).

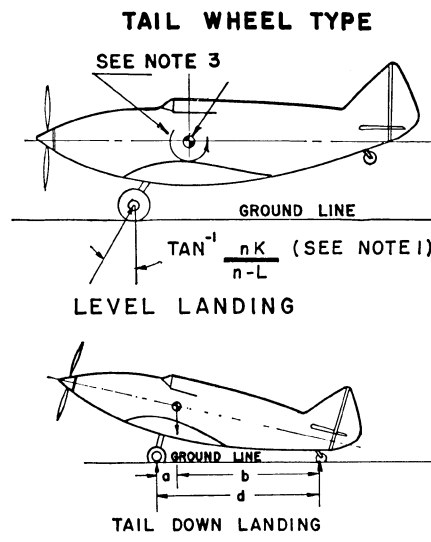
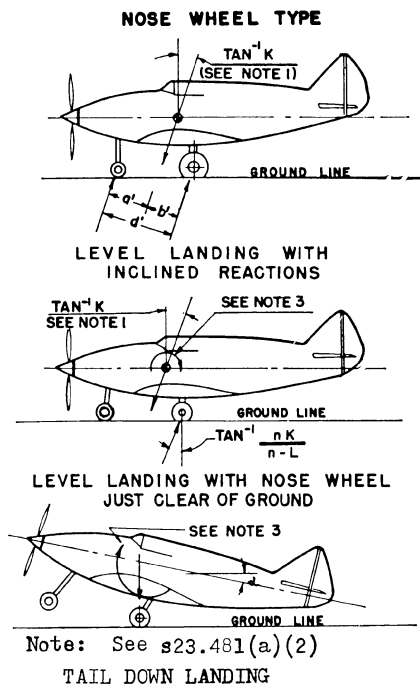
NOTE (1). K may be determined as follows: $K=0.25$ for $W=3,000$ pounds or less; $K=0.33$ for $W=6,000$ pounds or greater, with linear variation of K between these weights.

NOTE (2). For the purpose of design, the maximum load factor is assumed to occur throughout the shock absorber stroke from 25 percent deflection to 100 percent deflection unless otherwise shown and the load factor must be used with whatever shock absorber extension is most critical for each element of the landing gear.

NOTE (3). Unbalanced moments must be balanced by a rational or conservative method.

NOTE (4). L is defined in § 23.735(b).

NOTE (5). n is the limit inertia load factor, at the c.g. of the airplane, selected under § 23.473 (d), (f), and (g).

**BASIC LANDING CONDITIONS**

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964, as amended by Amdt. 23-7, 34 FR 13099, Aug. 13, 1969]

APPENDIX D TO PART 23—WHEEL SPIN-UP AND SPRING-BACK LOADS**D23.1 Wheel spin-up loads.**

(a) The following method for determining wheel spin-up loads for landing conditions is based on NACA T.N. 863. However, the drag component used for design may not be less than the drag load prescribed in § 23.479(b).

$$F_{Hmax} = 1/r_e \sqrt{2I_w(V_H - V_c)nF_{Vmax}/t_s}$$

where—

F_{Hmax} —maximum rearward horizontal force acting on the wheel (in pounds);

r_e —effective rolling radius of wheel under impact based on recommended operating tire pressure (which may be assumed to be equal to the rolling radius under a static load of $n_j W_e$) in feet;

I_w =rotational mass moment of inertia of rolling assembly (in slug feet);

V_H =linear velocity of airplane parallel to ground at instant of contact (assumed to be $1.2 V_{SO}$, in feet per second);

V_c =peripheral speed of tire, if prerotation is used (in feet per second) (there must be a positive means of pre-rotation before pre-rotation may be considered);

n =effective coefficient of friction (0.80 may be used);

F_{Vmax} =maximum vertical force on wheel (pounds)= $n_j W_e$, where W_e and n_j are defined in § 23.725;

t_s =time interval between ground contact and attainment of maximum vertical force on wheel (seconds). (However, if the value of F_{Vmax} , from the above equation exceeds $0.8 F_{Hmax}$, the latter value must be used for F_{Hmax} .)

(b) The equation assumes a linear variation of load factor with time until the peak load is reached and under this assumption, the equation determines the drag force at the time that the wheel peripheral velocity at radius r_e equals the airplane velocity. Most shock absorbers do not exactly follow a linear variation of load factor with time. Therefore, rational or conservative allowances must be made to compensate for these variations. On most landing gears, the time for wheel spin-up will be less than the time required to develop maximum vertical load factor for the specified rate of descent and forward velocity. For exceptionally large wheels, a wheel peripheral velocity equal to the ground speed may not have been attained at the time of maximum vertical gear load. However, as stated above, the drag spin-up load need not exceed 0.8 of the maximum vertical loads.

(c) Dynamic spring-back of the landing gear and adjacent structure at the instant just after the wheels come up to speed may result in dynamic forward acting loads of considerable magnitude. This effect must be determined, in the level landing condition, by assuming that the wheel spin-up loads calculated by the methods of this appendix are reversed. Dynamic spring-back is likely to become critical for landing gear units having wheels of large mass or high landing speeds.

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964, as amended by Amdt. 23-45, 58 FR 42167, Aug. 6, 1993]

APPENDIX E TO PART 23 [RESERVED]

APPENDIX F TO PART 23—TEST PROCEDURE

Acceptable test procedure for self-extinguishing materials for showing compliance with §§ 23.853, 23.855 and 23.1359.

(a) *Conditioning.* Specimens must be conditioned to 70 degrees F, plus or minus 5 degrees, and at 50 percent plus or minus 5 percent relative humidity until moisture equilibrium is reached or for 24 hours. Only one specimen at a time may be removed from the conditioning environment immediately before subjecting it to the flame.

(b) *Specimen configuration.* Except as provided for materials used in electrical wire and cable insulation and in small parts, materials must be tested either as a section cut from a fabricated part as installed in the airplane or as a specimen simulating a cut section, such as: a specimen cut from a flat sheet of the material or a model of the fabricated part. The specimen may be cut from any location in a fabricated part; however, fabricated units, such as sandwich panels, may not be separated for a test. The specimen thickness must be no thicker than the minimum thickness to be qualified for use in the airplane, except that: (1) Thick foam parts, such as seat cushions, must be tested in $\frac{1}{2}$ inch thickness; (2) when showing compliance with § 23.853(d)(3)(v) for materials used in small parts that must be tested, the materials must be tested in no more than $\frac{1}{8}$ inch thickness; (3) when showing compliance with § 23.1359(c) for materials used in electrical wire and cable insulation, the wire and cable specimens must be the same size as used in the airplane. In the case of fabrics, both the warp and fill direction of the weave must be tested to determine the most critical flammability conditions. When performing the tests prescribed in paragraphs (d) and (e) of this appendix, the specimen must be mounted in a metal frame so that (1) in the vertical tests of paragraph (d) of this appendix, the two long edges and the upper edge are held securely; (2) in the horizontal test of paragraph (e) of this appendix, the two long edges and the edge away from the flame are held securely; (3) the exposed area of the specimen is at least 2 inches wide and 12 inches long, unless the actual size used in the airplane is smaller; and (4) the edge to which the burner flame is applied must not consist of the finished or protected edge of the specimen but must be representative of the actual cross section of the material or part installed in the airplane. When performing the test prescribed in paragraph (f) of this appendix, the specimen must be mounted in metal frame so that all four edges are held securely and the exposed area of the specimen is at least 8 inches by 8 inches.

(c) *Apparatus.* Except as provided in paragraph (g) of this appendix, tests must be conducted in a draft-free cabinet in accordance with Federal Test Method Standard 191 Method 5903 (revised Method 5902) which is available from the General Services Administration, Business Service Center, Region 3, Seventh and D Streets SW., Washington,